PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 6069PTWO/AG/la	**FOR FURTHER ACTION**	See Form PCT/IPEA/416
International application No. PCT/EP2004/051207	International filing date *(day/month/year)* 23.06.2004	Priority date *(day/month/year)* 24.06.2003
International Patent Classification (IPC) or national classification and IPC H01M4/86, H01M8/18, H01M8/04, C25B1/12		
Applicant MELOSI, Mario		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 2 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☒	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☒	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
05.09.2005	15.11.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Fitzpatrick, J Telephone No. +49 89 2399-8570

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2004/051207

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages	
1-11	as originally filed
Claims, Numbers	
1-13	received on 26.09.2005 with letter of 21.09.2005
Drawings, Sheets	
1/2, 2/2	as originally filed

   ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☒ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☒ the claims, Nos. 1,5,8,11
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2004/051207

Box No. II Priority

1. ☒ This report has been established as if no priority had been claimed due to the failure to furnish within the prescribed time limit the requested:
   - ☐ copy of the earlier application whose priority has been claimed (Rule 66.7(a)).
   - ☒ translation of the earlier application whose priority has been claimed (Rule 66.7(b)).
2. ☐ This report has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rule 64.1). Thus for the purposes of this report, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-4,6-10,12,13
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-4,6-10,12,13
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-4,6-10,12,13
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Section I.4: Unallowable Amendments

(i) The wording "and an external heat source" and the word "between" (rather than "in") in independent claims 1 and 8 have not been taken into account in giving rise to embodiments extending beyond the disclosure as originally filed and is thus contrary to Art.34(2)(b) PCT. Thus, whilst the remaining amendments to the independent claims essentially find fair bases in original claim 7 (or 13) and Fig.1 ("circulating" electrolyte), the feature corresponding to said above offending wording has only been used in the originally filed application in connection with the use of the electrochemical cell for **water electrolysis** (page 7, lines 8-10) which is an endothermic process. The combination of the cell of claim 1 with its external heat source and the additional subject matter of claim 7, namely the **fuel cell** mode with O_2 and H_2 feed gases is no where suggested in the originally filed application. This would also be contrary to technical sense as electrical energy production with these reactants is an exothermic reaction requiring no heat input.

Similarly, heat exchange **between** the porous electrodes is not the meaning that emerges from original claim 7. Such an interpretation moreover finds no fair basis anywhere in the originally filed application.

(ii) The basis given by the applicant for the subject matters of new claims 5 and 11, namely page 10, lines 22-25 refers to "the contact time of the multi-phase interface .... is approaching the reaction times of the electrochemical reactions" and certainly provides no acceptable basis for the new subject matters of these claims.

Section V.2: Citations and Explanations

D1: FR-A-1 452 701 (OFFICE NATIONAL INDUSTRIEL DE L'AZOTE) 15 April 1966 (1966-04-15)

D2: KORDESCH ET AL: "Electrode Designs and Concepts for Bipolar Alkaline Fuel cells" INT.J. HYDRGEN ENERGY, vol. 10, no. 5, 1985, pages 317-324, XP002329059 GB

D3: US-A-3 338 747 (PLUST HEINZ GUNTHER ET AL) 29 August 1967 (1967-08-29)

D4: US-A-3 391 028 (VOSE RICHARD S) 2 July 1968 (1968-07-02)

Documents D3 and D4 both disclose application of pressure pulses via the gas supply circuit to the gas side of porous electrodes of fuel cells. This is very similar but perhaps cannot be expected to have exactly the same effect as pressure pulses applied directly to the electrolyte as in the current application. The latter approach in view of the incompressibility of liquids vs. gas, transmits the pulses instantaneously to the electrolyte within the pores of the porous electrodes with all ensuing positive effects thereof discussed on page 6, line 23 to page 7, line 1 and on page 10, lines 22 to 28. Document D1 however as well as disclosing the gas pressurising mode additionally discloses applying pressure pulses directly to the electrolyte of fuel cells containing porous electrodes (see Résumé, point 3°), such as those multi-layer structures suitable for alkaline fuel cells disclosed by Kordesch et al in document D2, whilst keeping the gas pressures constant.

The combination of the use of two pressure modulators in the manner claimed together with weeping electrodes as claimed and heat exchange in the porous electrodes through the circulating electrolyte flowing into the electrochemical cell is however neither fairly disclosed in document D1 nor derivable from any combination of the available prior art documents. As this is moreover associated with unexpectedly high improvements in energetic yields together with enhanced electrode lifetime, the requirements of Art.33(3) PCT are also considered to be fulfilled.

Section VII: Certain Defects

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1, D3 and D4 is not mentioned in the description, nor are these documents identified therein.

Section VIII: Certain Observations pertinent to Art.6 PCT

The description is not in conformity with the claims as required by Rule 5.1(a)(iii) PCT.